

## **REMARKS**

Claims 1 through 31 were presented for examination. Claims 1 through 31 were rejected.

The applicants respectfully traverse the rejections and request reconsideration in light of the following comments.

### **35 U.S.C. 103 Rejection of Claims 1-7, 9-20, and 23-31**

Claims 1 through 7, 9 through 20, and 23 through 31 were rejected under 35 U.S.C. 103(a) as being as being unpatentable over F. Zhong, et al., U.S. Patent 6,826,345, issued Nov. 30, 2004 (hereinafter "Zhong") in view of S.W. Roberts, U.S. Patent Application 2002/0122651, published Sep. 5, 2002 (hereinafter "Roberts"). The applicants respectfully traverse the rejection.

These rejected claims include four claim sets based on different independent claims: Claims 1 through 7, and 9; Claims 10 through 15; Claims 16 through 20, and 23 through 28; and Claims 29 through 31. Each claim set will be discussed independently below.

#### **Claims 1 through 7, and 9**

Claim 1 recites:

**1.** An article comprising;  
a composite guiding region having at least three layers, wherein:  
*two of said three layers have stress of the same sign;*  
said two layers are separated by one or more interposed layers;  
*said one or more interposed layers have stress of opposite sign* relative  
to said two layers; and  
said interposed layers are suitable for guiding light based on the  
relative refractive indices of said interposed layers and said two layers.  
(emphasis supplied)

Nowhere does Zhong or Roberts teach or suggest, alone or in combination with the other references, what claim 1 recites – namely that a light guiding layer is “sandwiched” between two layers of material that have the opposite stress.

The distinction is important because the provision of opposing layers of opposite stress enables better control of the stress distribution in the interposing layer. In addition,

opposing layers of opposite stress enables provides a means of balancing stress in the interposing layer or layers.

Zhong shows the addition of a cap layer on top of a waveguide core. No indication of the sign of stress, relative to the waveguide core is provided. In addition, the addition of no other layers than the cap layer is taught (*i.e.*, no suggestion of an underlying layer or sidewall layers is provided). In fact, Zhong explicitly precludes material on any surface but the top of the waveguide core in Column 6, lines 58-63, where he states:

The top cap 50 covers the upper portion or top surface of waveguide core 48 since the combined structure is formed from two continuous layers of material. The top cap 50 *does not cover the entire surface of waveguide core 48 above the bottom clad layer 34 (does not cover the waveguide core 48 sidewalls)*.

(emphasis supplied)

Roberts teaches the formation of silicon dioxide on three surfaces of a silicon waveguide. Since silicon is a stress-free material, silicon dioxide is not a material of "opposite stress" as claimed by the applicants.

Since Zhong teaches away from that taught by Roberts, and Roberts does not cure the deficiencies of Zhong, the applicants respectfully submit that the rejection of claim 1 is traversed.

Because claims 2 through 7 and claim 9 depend on claim 1, the applicants respectfully submit that the rejection of them is also traversed.

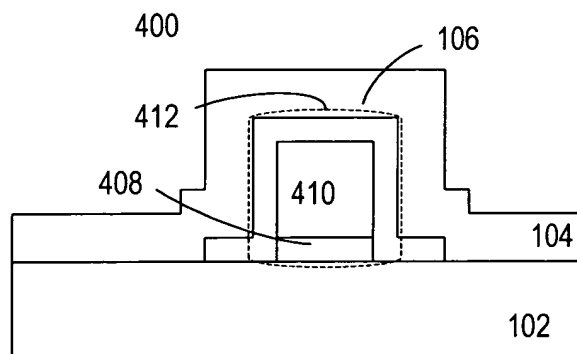
Claims 10 through 15

Claim 10 recites:

**10.** A surface waveguide comprising;  
 a lower cladding layer comprising a lower cladding material; and  
*a core comprising an inner core and an outer core, wherein:*  
 said inner core comprises one or more layers of inner core material;  
 said inner core material supports propagation of light;  
*said inner core material has a first stress;*  
 said outer core surrounds said inner core; and  
*said outer core comprises an outer core material having a second stress of opposite sign relative to said first stress; and*  
 an upper cladding comprising an upper cladding material, wherein said lower cladding material and said upper cladding material have indices of refraction lower than the index of refraction of said outer core material.  
 (emphasis supplied)

Nowhere does Zhong or Roberts teach or suggest, alone or in combination with the other references, what claim 1 recites – namely that a waveguide core comprises an inner core material having one sign of stress and an outer core material having the opposite sign of stress.

The distinction is important because the provision of an outer core of opposite stress from an inner core enables better control over the stress configuration of the inner core. Figure 4 of the instant application depicts inner core 410 surrounded by outer core 412:



*Figure 4 of the instant application*

As is apparent from Figure 4, outer core 412 completely surrounds inner core 410. Therefore, outer core 412 causes a radial stress gradient in all directions from the center of inner core 410. Therefore, the stress configuration of inner core 410 can be completely controlled by appropriate design of outer core 412.

Zhong teaches only the addition of a cap layer on top of a waveguide core (e.g., inner core 410). In addition and as discussed earlier, Zhong precludes an outer core that surrounds an inner core by teaching away from the addition of material on the sidewalls of inner core 410. In addition, Zhong does not teach the addition of a material having opposite stress to that of a waveguide core.

Roberts teaches only the addition of material on the top and sidewalls of a silicon waveguide core. Roberts does not teach or suggest the formation of an outer core that completely surrounds an inner core, as is taught by the applicants.

Since neither Zhong nor Roberts teaches or suggests, alone or in combination, what is claimed in claim 10, and Roberts does not cure the deficiencies of Zhong, the applicants respectfully submit that the rejection of claim 10 is traversed.

Because claims 11 through 15 depend on claim 10, the applicants respectfully submit that the rejection of them is also traversed.

Claims 16 through 20 and 23 through 28

Claim 16 recites:

**16.** A method of forming a surface waveguide comprising;  
depositing on a surface of a substrate a first conformal layer comprising *a first material having a first stress*;  
depositing on said first conformal layer a second conformal layer comprising a second material, *wherein said second material has a second stress of opposite sign relative to said first stress*;  
depositing on said second conformal layer a third conformal layer of a third material, *wherein said third material has a third stress of the same sign relative to said first stress*.  
(emphasis supplied)

Nowhere does Zhong or Roberts teach or suggest, alone or in combination with the other references, what claim 16 recites – namely a method of forming a waveguide core that

comprises three conformal layers, wherein the two outer layers have a stress that is opposite of the stress of the interposing layer.

As discussed earlier, Zhong teaches away from Roberts, while teaching only the addition of a top "cap layer" on a waveguide core. In addition, Zhong does not address the relative stress of the cap layer with respect to the waveguide core.

Since Zhong teaches away from that taught by Roberts, and Roberts does not cure the deficiencies of Zhong, the applicants respectfully submit that the rejection of claim 16 is traversed.

Because claims 17 through 20 and 23 through 28 depend on claim 16, the applicants respectfully submit that the rejection of them is also traversed.

Claims 29 through 31

Claim 29 recites:

**29.** A method of reducing modal birefringence in a surface waveguide comprising;  
*forming a composite guiding region comprising an inner core of a first material surrounded by an outer core of a second material wherein:*  
*said inner core has a first stress; and*  
*said first material supports propagation of light; and*  
*said outer core has a second stress having opposite sign relative to said first stress; and*  
*said second stress compensates said first stress such that the modal birefringence of said composite guiding region is less than 0.0001.*  
(emphasis supplied)

Nowhere does Zhong or Roberts teach or suggest, alone or in combination with the other references, what claim 29 recites – namely a method of forming a waveguide core that comprises an inner core having one stress and an outer core having the opposite stress.

As discussed earlier, Zhong teaches only the addition of a top cap layer on a waveguide core and explicitly precludes the addition of material on the sidewalls of a waveguide core (*i.e.*, an inner core – in the applicants' terminology). In addition, Zhong does not address the relative stress of the cap layer with respect to the waveguide core.

Since Roberts does not cure the deficiencies of Zhong, the applicants respectfully submit that the rejection of claim 29 is traversed.

Because claims 30 and 31 depend on claim 29, the applicants respectfully submit that the rejection of them is also traversed.

**35 U.S.C. 103 Rejection of Claims 8, 21, and 22**

Claims 8, 21, and 22 were rejected under 35 U.S.C. 103(a) as being as being unpatentable over Zhong in view of Roberts and in further view of T. Inoue, et al., U.S. Patent Application 2003/0152353, published Aug. 14, 2003 (hereinafter "Inoue"). The applicants respectfully traverse the rejection.

Inoue teaches the use of ZnO material to generate tensile stress *in the cladding layers of a waveguide*. As described in paragraph [0046] of Inoue, the tensile stress in the cladding layers are generated to counteract stresses caused by a difference in the thermal expansion coefficients of the substrate and the cladding layer material.

Claim 8 is dependent upon Claim 1. Inoue does not cure the deficiencies of Zhong, or Zhong in view of Roberts, as outlined above. The applicants, therefore, respectfully submit that the rejection of claim 8 is traversed.

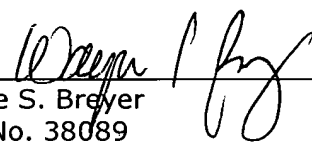
Claims 21 and 22 are dependent upon Claim 16. Inoue does not cure the deficiencies of Zhong, or Zhong in view of Roberts, as outlined above. The applicants, therefore, respectfully submit that the rejection of claims 21 and 22 are traversed.

**Request for Reconsideration Pursuant to 37 C.F.R. 1.111**

Having responded to each and every ground for objection and rejection in the Office action mailed August 9, 2005, applicants request reconsideration of the instant application pursuant to 37 CFR 1.111 and request that the Examiner allow all of the pending claims and pass the application to issue.

Should there remain unresolved issues the applicants respectfully request that Examiner telephone the applicants' attorney at 732-578-0103 x12 so that those issues can be resolved as quickly as possible.

Respectfully,  
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